

REMARKS

Applicants respectfully request reconsideration of the present application in view of the reasons that follow. A detailed listing of all claims that are, or were, in the application, irrespective of whether the claim(s) remain under examination in the application, is presented, with an appropriate defined status identifier.

I. Introduction

Claims 1, 8, 17, 24, 94, 114, 115, 119, 133 and 134 have been elected for examination. Non-elected dependent claims 2-7, 18-23, 95-100, 105-113, 116-118, 124-132, 135-137, and 141-143 are withdrawn from consideration. Applicants respectfully request that these dependent claims be rejoined with the independent claim from which they depend upon the allowance of the respective independent claim(s).

Claims 101-104, 120-123, and 138-140, and non-elected claims 9-16, 25-93, 144-151 are cancelled without prejudice or disclaimer to present these claims in a divisional application. New claims 152-159 have been added. Support for the new claims can be found throughout the specification, such as in paragraphs 23, 36, 40, 41, 44, 121, 133, 137 and 157 of the published version of the present application (i.e., in published application 2004/0075464). No new matter was added.

Claims 1-8, 17-24, 94-100, 105-119, 124-137, 141-143 and 152-159 are pending in this application.

II. The Rejections Should Be Withdrawn

Claims 1, 8, 17, 24, 94, 114, 115, 119, 133 and 134 have been rejected under 35 U.S.C. § 102(b) or § 103(a) over Hiruma et al. (Journal of Crystal Growth 1996 article). Claims 1, 8, 17, 24, 94, 114, 115, 119, 133 and 134 have been rejected under 35 U.S.C. § 102(b) or § 103(a) over Gudiksen et al. (Nature 2002 article). These rejections are respectfully traversed.

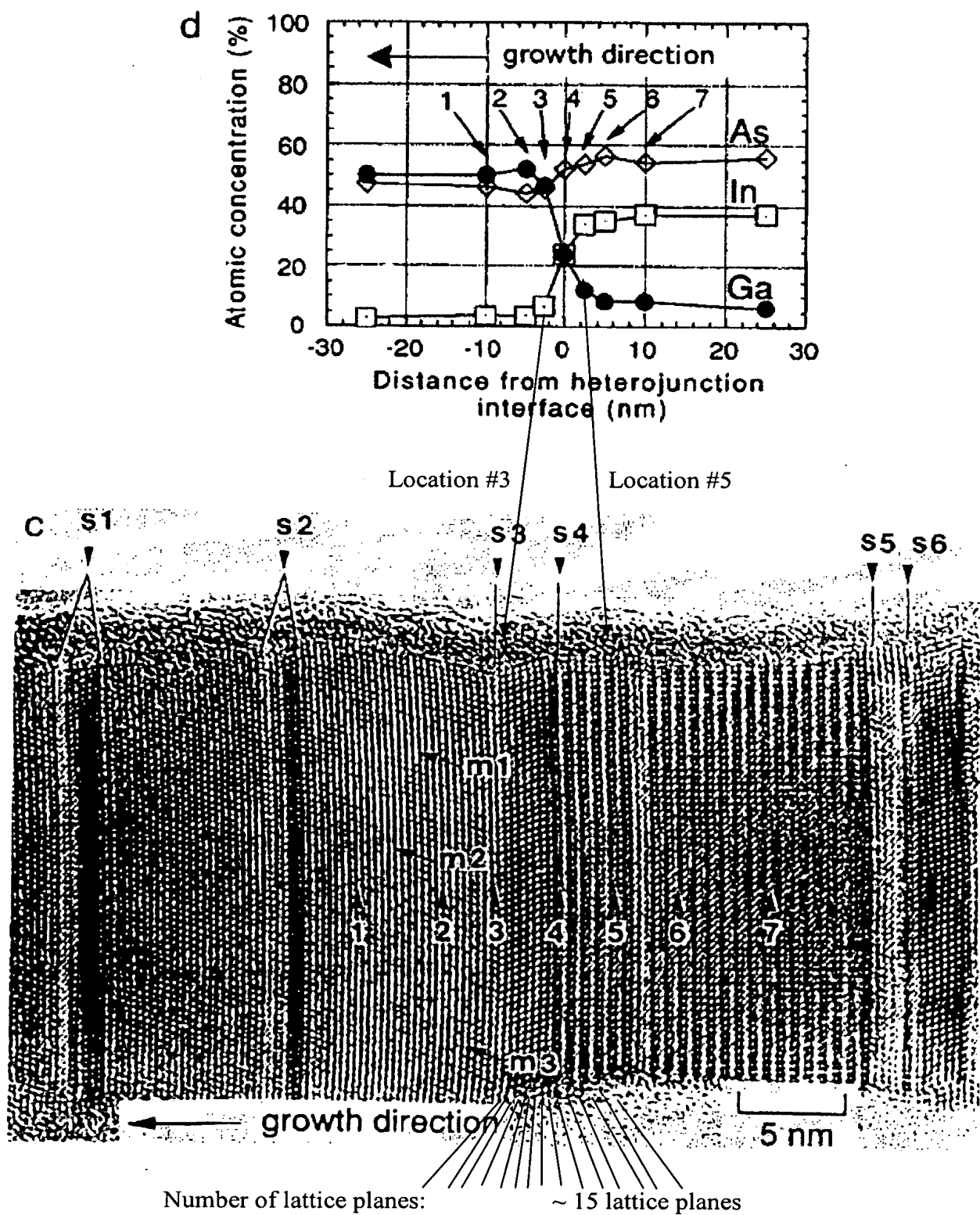
Claim 1 recites, “the composition boundary between the crystalline materials of the first and second segments extends over an axial interval of not more than 10 diametral lattice planes.” Claim 17 recites, “said material boundary defined by a transition between said different crystalline materials occurring within an axial interval of not more than ten diametral lattice planes.” Claim 94 recites, “said interface constituting a junction at which said first composition changes to said second composition within an axial distance of not greater than 10 diametral lattice planes.” Claim 119 recites, “said interface constituting a junction at which said first composition changes to said second composition within an axial distance of not greater than 10 diametral lattice planes.” (emphases added).

Because neither Hiruma nor Gudiksen teaches or suggests a composition change occurring within 10 diametral lattice planes, the rejections should be withdrawn.

A. Hiruma

Hiruma analyzed GaAs/InAs heterostructure wires using both transmission electron microscopy (TEM) and energy dispersive X-ray analysis (EDX) (see page 228, Figure 3). For the Office’s convenience, Figures 3c and 3d of Hiruma are reproduced below. In particular, Figure 3c is a TEM image of the area around the GaAs/InAs heterojunction interface, with labeled numbers 1-7 in Figure 3c corresponding to locations on the sample where EDX analysis was performed. Figure 3d plots this EDX data as a function of the distance from the heterojunction interface. Figure 3d shows that the composition change from GaAs to InAs occurs, at best, between Location #3 and Location #5. However, the composition change arguably occurs within a distance that is even larger than that.

Next, by counting the number of lattice planes in Figure 3c between Location #3 and Location #5, it is directly evident that Hiruma’s GaAs/InAs heterostructures do not undergo a composition change within 10 diametral lattice planes. Rather, there are ~ 15 lattice planes between Location #3 and Location #5 in Figure 3c.

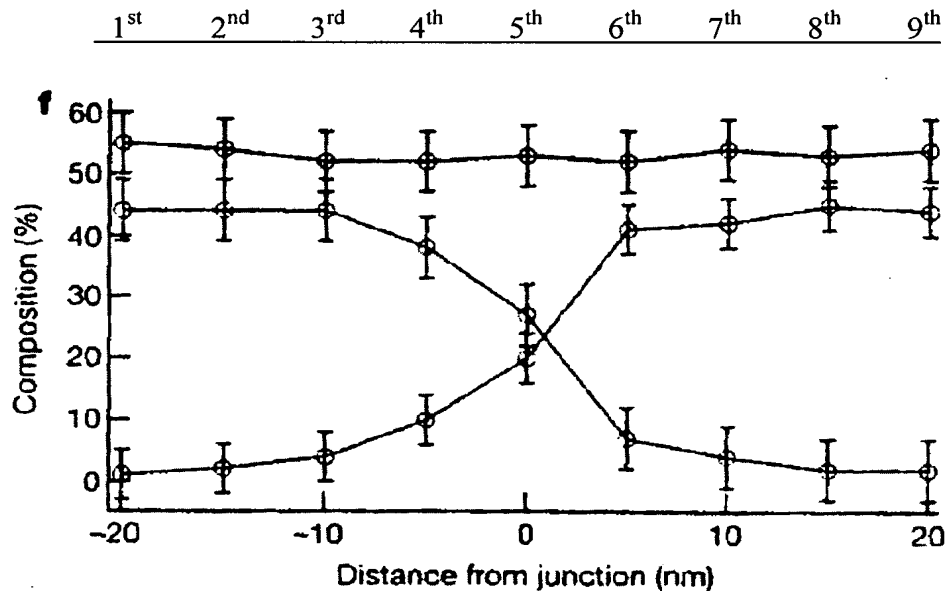


Not only does Hiruma fail to teach or suggest a composition change occurring within 10 diametral lattice planes, but Hiruma also fails to enable how to make such a sharp heterojunction. Therefore, not more than 10 lattice plane limitation of the claims of the present application is not obvious from Hiruma because Hiruma does not enable or teach how to make such a sharp interface.

For at least these reasons, Hiruma does not anticipate or render obvious claims 1, 17, 94, or 119. The rejected dependent claims are considered to be allowable over Hiruma at least for the same reasons.

B. Gudiksen

Gudiksen teaches GaAs/GaP nanowires junctions analyzed by TEM, with elemental mapping of the Ga, P, and As content measured at 9 locations at various distances from the junction (see page 618, Figure 2). As can be seen in Figure 2f, which is reproduced below, the composition of Gudiksen's heterojunction changes from GaAs to GaP within a region that is, at best, 10 nm in length (i.e., between the 4th and 6th data points in Figure 2f when counting from left to right). However, the composition change arguably occurs within a distance that is even larger than that. Indeed, Gudiksen admits that "the junction is not atomically abrupt, but rather makes the transition between GaP and GaAs phases over a length scale of 15-20 nm." page 617, column 2, full paragraph 2, lines 10-11.



Even assuming that this shorter 10 nm distance was the actual length of Gudiksen's composition change, it would correspond to a region having more than 10 diametral lattice planes. Indeed, Gudiksen states that the lattice constants were measured to be 0.5474 ± 0.0073 nm and 0.5668 ± 0.0085 nm for GaP and GaAs, respectively, which "are in good agreement with the [theoretical] values for both GaP (0.5451 nm) and GaAs (0.5653 nm)." page 617, column 2, full paragraph 1, lines 16-20. Again, for the sake of argument, assume in favor of Gudiksen and take the largest of these lattice constants as the appropriate spacing (i.e., 0.5668 ± 0.0085 nm). This would result in the smallest possible number of diametral lattice planes within Gudiksen's heterojunction. But even so, a 10 nm region having a lattice constant of 0.5668 ± 0.0085 nm does not contain fewer than 10 lattice planes:

$$(10 \text{ nm}) \left(\frac{1 \text{ lattice plane}}{0.5668 \text{ nm}} \right) = 18 \text{ lattice planes} > 10 \text{ lattice planes}$$

Thus, Gudiksen's heterojunction contains at least 18 lattice planes. Adding to this value the effect of the standard deviation cannot remedy Gudiksen's deficiency. Therefore, Gudiksen fails to teach or suggest a composition change occurring within 10 diametral lattice planes.

But not only does Gudiksen fail to teach or suggest “all the claim limitations” as required under MPEP § 2143.03 (citing *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1973)), Gudiksen also fails to enable such a sharp heterojunction. Therefore, not more than 10 lattice plane limitation of the claims of the present application is not obvious from Gudiksen because Gudiksen does not enable or teach how to make such a sharp interface

For at least these reasons, Gudiksen does not anticipate or render obvious claims 1, 17, 94, or 119. The rejected dependent claims are considered to be allowable over Hiruma at least for the same reasons.

III. Conclusion

Applicants believe that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested. The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by a check or credit card payment form being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicant hereby petitions for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 19-0741.

Respectfully submitted,

Date 5/29/07

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